APPENDIX H

Memo

DATE: May 1, 2000
FILE: 30-1307-10.001

TO: Nolte Associates, Inc.
FROM: Kleinfelder

SUBJECT: Technical Memorandum
Draft Disposal Options for Petroleum Contaminated Soil
Reno Railroad Corridor Project

This technical memorandum provides a listing and description of options for the disposal of soil that would be generated by the Reno Railroad Corridor project through downtown Reno, Nevada. The options include reuse, disposal and treatment, with the understanding that both clean and petroleum contaminated soils will be generated as byproducts/construction waste. The level of detail is preliminary since the information on the soil volumes, classification and presence of petroleum contaminants is also preliminary. We have itemized our assumptions in order to provide a comparison of the benefits of each option.

Assumptions and Project Specifics

Kleinfelder reviewed the plans and profiles prepared for the depressed rail design options, and the information obtained on the soil from the borings and the analytical results as discussed in the main body of this report. The soils below the present alignment consist of clays, silt, sand, gravel, cobbles and boulders, in various mixtures (Geotechnical Engineering Report, Kleinfelder). Additionally, some of the soils contain petroleum from historic fuel releases. These conditions indicate that selected options for reuse, treatment and/or disposal of the soil will depend on the soil type, the presence of petroleum, and the kinds of reuse options available at the time the soils are excavated and available.

Mitigation measures for soil with excessive concentrations of petroleum depend on the degree of contamination. In Nevada, soils containing less than 100 milligrams per kilograms (mg/kg) of total petroleum hydrocarbons as assessed using modified EPA Method 8015 are not subject to state or county regulation. Soils containing more than 100 mg/kg of petroleum contamination must be treated as a regulated hydrocarbon waste and are subject to state and local restrictions in use, to issues of liability, to special permitting requirements and usually to some form of treatment. Depending on the option(s) selected, disposal/treatment must be addressed with and permitted by the Washoe County District Health Department (WCDHD) and/or the Nevada Division of Environmental Protection (NDEP). Soils with petroleum concentrations below 100 mg/kg may still be subject to issues of liability. Liability is defined herein as the potential exposure to third party legal action due to the re-use on public agency projects and the reuse/resale of these materials as commodities.

For each option listed below, some means of segregation of the finer and coarser components of the soil must be considered to reduce costs and enhance the usability of the soils. Boulders, cobbles and coarse gravel are typically exempt from treatment as contaminated media, and therefore would be separated by a physical screening process and not transported to a treatment site. Most use/reuse options require a specific range of soil particles sizes, so again screening of soil may be appropriate. Once screened, each resulting portion of the excess soils may have separate reuses/treatments and /or destinations.

A summary of the analytical results of soil samples for petroleum compounds collected from boreholes along the railway as part of Kleinfelder's geotechnical investigation are found in Appendix D of the Kleinfelder geotechnical report and Table 1 herein. Borehole locations are shown in Appendix A of the geotechnical report. Analyses were conducted by a fixed laboratory, Alpha Analytical of Sparks, Nevada (Alpha), as well as by Kleinfelder personnel using a semi-quantitative field extraction and analytical kit (PetroFlag). A comparison of the analytical results for both methods is included in Attachment A of this memo.

The attached graphical comparison of petroleum concentrations as assessed using PetroFlag versus Alpha shows that there is little apparent correlation between the two data sets. This non-correlation is most likely attributable to the apparent variable nature of petroleum products found in the soil over the project area. Since the petroleum came from unknown and different sources, a generic default setting was used on the PetroFlag analytical instrument to calculate the concentration. Thus, the instrument may have been more or less sensitive to a particular type of petroleum in any one sample. Given this variability in analytical results, we chose to rely most on the limited data from samples analyzed by Alpha. The samples analyzed by Alpha were those found to have the highest apparent concentration of petroleum, using PetroFlag, at each individual borehole. Using the analytical data from samples analyzed by Alpha, we computed volumes of soil with ranges of petroleum concentrations based on relative percentages of the number of samples containing a given amount of petroleum as defined below. Since we based this assessment on the samples with the highest apparent petroleum concentration, the relative volumes of soil with varying ranges of petroleum should be considered conservative. However, it should be noted that due to project constraints during the field portion of this study, none of the samples analyzed were obtained from within the actual rail corridor. Given the high degree of spatial variability in petroleum concentrations in a plume in soil, the assessed volumes may not totally reflect conditions to be encountered below the present rail alignment.

Based on these data, we anticipate that about 80% of the soil will have a petroleum concentration between 10 mg/kg (the detection limit) and 100 mg/kg, about 15% will have a petroleum concentration between 100 mg/kg and 600 mg/kg, and about 5% will have a petroleum content greater than 600 mg/kg. The segregation of soil based on concentrations of TPH will require continuous monitoring of the soil by an experienced environmental specialist during excavation activities. The specialist may rely on such techniques as field analytical instruments, fixed based laboratory analyses, odors and soil discoloration. Temporary segregation of soil stockpiles may be necessary as excavation progresses to complete the necessary field/lab testing and to designate each stockpile for its appropriate transport and management.

For the purposes of estimating the quantities and types of soil to be excavated, we made the following assumptions:

Volume calculation:	531,670 cubic yards (HDR estimate)
Re-use, this project:	2560 cubic yards
Soil Volume:	60 % (less than 6 inch diameter) = 317,466 cubic yards
Rock volume:	40 % (more than 6 inch diameter) = 211,644 cubic yards
Excessive Petroleum (>600 mg/kg):	5 % of the 60 % figure=15,873 cubic yards

We used the preceding assumptions in selecting and evaluating the options below. A list of options and a discussion of their apparent beneficial and negative attributes is presented in Attachment B. The accuracy of assumptions used in assessing each option vary. This is because the soil borings, from which the soil samples were collected for analyses, were located outside the actual rail corridor alignment. The volume of soil estimated may vary depending on the type of construction method used, final grades and the volumes resulting from constructing the shoofly. It is assumed that the relative amounts of petroleum contaminated soil along the shoofly route is similar to that encountered in the borings. Some of these assumptions cannot yet be independently verified, and some may substantially vary based on decisions made after this document is published. These assumptions and values, with their varying degrees of accuracy, serve the purpose of evaluating the various options, and to enable a shorter list of viable options to be selected. The shorter list can then be subsequently reviewed in greater and more accurate detail.

Options Matrix

The matrix below shows the options with four criteria used to evaluate each option. The matrix allows the reviewer to compare options against each other based on implementability (ease of implementation), treatment effectiveness (the degree to which an option can provide for reuse, disposal and/or treatment of all the soils), cost effectiveness, and treatment completeness (degree to which the method provides complete treatment of the petroleum hydrocarbons). The matrix is qualitative. The numbers shown are intended to allow the reviewer to compare the options. The values shown reflect Kleinfelder's experience, our current understanding of the project objectives, and our current understanding of the acceptability of each option both to the regulating agencies and responsible project managers.

Based on the information presented herein and at this time, Kleinfelder believes the best mix of options based on the selection criteria is thermal incineration at Nevada Thermal Services (NTS) of soils with concentrations of petroleum hydrocarbons greater than 600 mg/kg. The soils with concentrations of petroleum hydrocarbons of less than 600 mg/kg would be reused/disposed of at the Lockwood Landfill. This mix of options appears to provide several critical advantages to include; speed of removal of soil from the construction area, appropriate levels of treatment, minimal need for storage space in the construction area, predictability of costs, predictability of the treatment and disposal methods being available at a future date, and the highest reuse potential. This mix of options could change based on construction choices yet to be made and final site conditions yet to be verified.

We believe the foregoing provides a useful review of options for the reuse, treatment and disposal of soils to be generated by the lowering of the railroad through downtown Reno. We look forward to discussing these options further with you and to helping focus those options deemed most viable to the City of Reno.

OPTIONS MATRIX
Evaluation Criteria for
Options for Reuse, Disposal and Treatment of Excess Soil
Reno Railroad Corridor Project

Options	Criteria (1)				
	Implementability (2)	Treatment (2) Effectiveness	Cost Effectiveness	Treatment Completeness	Totals
Reuse:					
1 City of Reno Projects	1	1	5	1	8
2 Other Public Projects	2	2	5	1	10
3 Private Sector	4	4	5	3	16
4 Reno Disposal	3	5	3	5	16
5 Union Pacific	2	3	3	3	11
6 Reno Rail Corridor Project	3	3	3	2	11
Disposal:					
7. Lockwood Landfill	5	5	5	5	20
8. Other Facilities	1	5	1	5	12
Treatment:					
9. Nevada Thermal Services	5	5	4 (3)	5	19
10. Lockwood Landfill	5	5	4 (3)	3	17
11. Other Facilities	1	5	1	3	10
12. On-site Bioremediation	3	2	3 (4)	3	11
13. On-site Incineration	3	5	2 (4)	5	15

(1) A score of 1 is low, of 5 is high.
(2) Implementability: the ease with which an option can be implemented
Treatment Effectiveness: The degree to which an option can provide for reuse/disposal and/or treatment of all the soils.
Treatment Completness: The degree to which an option treats the soil for petroleums, thereby reducing liability to the generator.
(3) Concentration dependent of petroleums in soil
(4) Volume dependent

TABLE 1

RENO RAILROAD CORRIDOR PROJECT
SOIL SAMPLE ANALYTICAL DATA
MAN MADE CHEMICALS

Boring	Sample Number	Lab ID#	Depth (feet)	TPH [1] (mg/kg)	Volatile Organics (mg/kg)	TPH by PetroFlag (mk/kg)
B-1	1,B-23	KLF99071650-01A	31	36	ND[2]	***
	B1-2	KLF99081622-06A	13	20	ND	171
	B1-3		16		---	73
B-2	B2-5	KLF990081622-01A	5	126	ND	634
	B2-10		10		---	64
	B2-15		15		---	165
B-4	B4-11	KLF990081622-02A	11	70	ND	158
	B4-14		14		---	39
	B4-20		20		---	145
	B4-25		25		---	86
B-6	B6-S1	KLF99083028-01A	2.5	11	ND	9
	B6-S2		5		---	0
	B6-S3U		10		---	0
	B6-S3L		10		---	0
B-7	B7-7	KLF99081622-03A	7	108	ND	550
	B7-17		17		---	NR
	B7-27		27		---	105
	B7-37		37		---	55
B-8	B8-1B	KLF99082533-01A	8	33	ND	60
	B8-2B		12		---	41
	B8-6A		41		---	37
B-9	B9-2A	KLF99081622-07A	15	260	ND	567
	B9-3A		18		---	87
	B9-4A		29		---	232
	B9-5B		35		---	30
B-10	B10-8	KLF99081622-04A	8	24	ND	236
	B10-18		18		---	208
	B10-28		28		---	40
	B10-40		40		---	173

Boring	Sample Number	Lab ID#	Depth (feet)	TPH [1] (mg/kg)	Volatile Organics (mg/kg)	TPH by PetroFlag (mk/kg)
B-11	B11-8		8		---	86
	B11-18	KLF99082533-03A	18	22	ND	183
	B11-28		28		---	136
	B11-35		35		---	129
B-12	B12-8		8		---	75
	B12-18		128		---	72
	B12-28	KLF99081622-05A	28	ND	ND	169
	B12-38		38		---	166
B-14	B14-2B	KLF99081622-08A	29	64	ND	234
	B14-3A		33		---	115
	B14-4B		39		---	54
B-15	B15-45	KLF99073032-02A	45	ND	ND	---
B-17	B17-8		8		---	0
	B17-18		18		---	388
	B17-28	KLF99081927-04A	28	ND	ND	449
	B17-38		38		---	405
B-19	B19-5		5		---	120
	B19-10		10		---	100
	B19-15	KLF99072222-01A	15	ND	ND	119
	B19-20		20		---	73
B-20	B20-10		10		---	7
	B20-23		23		---	29
	B20-27		27		---	48
	B20-38	KLF99082427-01A	38	ND	ND	108
B-21	B-21B		5			83
	B-21G	KLF99072733-01A	41	ND	ND	89
	B-21H		46			83
	B-21J		63			52
B-22	B22-11	KLF99081927-05A	11	ND	ND	549
	B22-18		18		---	460
	B22-28		28		---	519
	B22-47		47		---	495
B-23	B23—2B		47	----	---	37

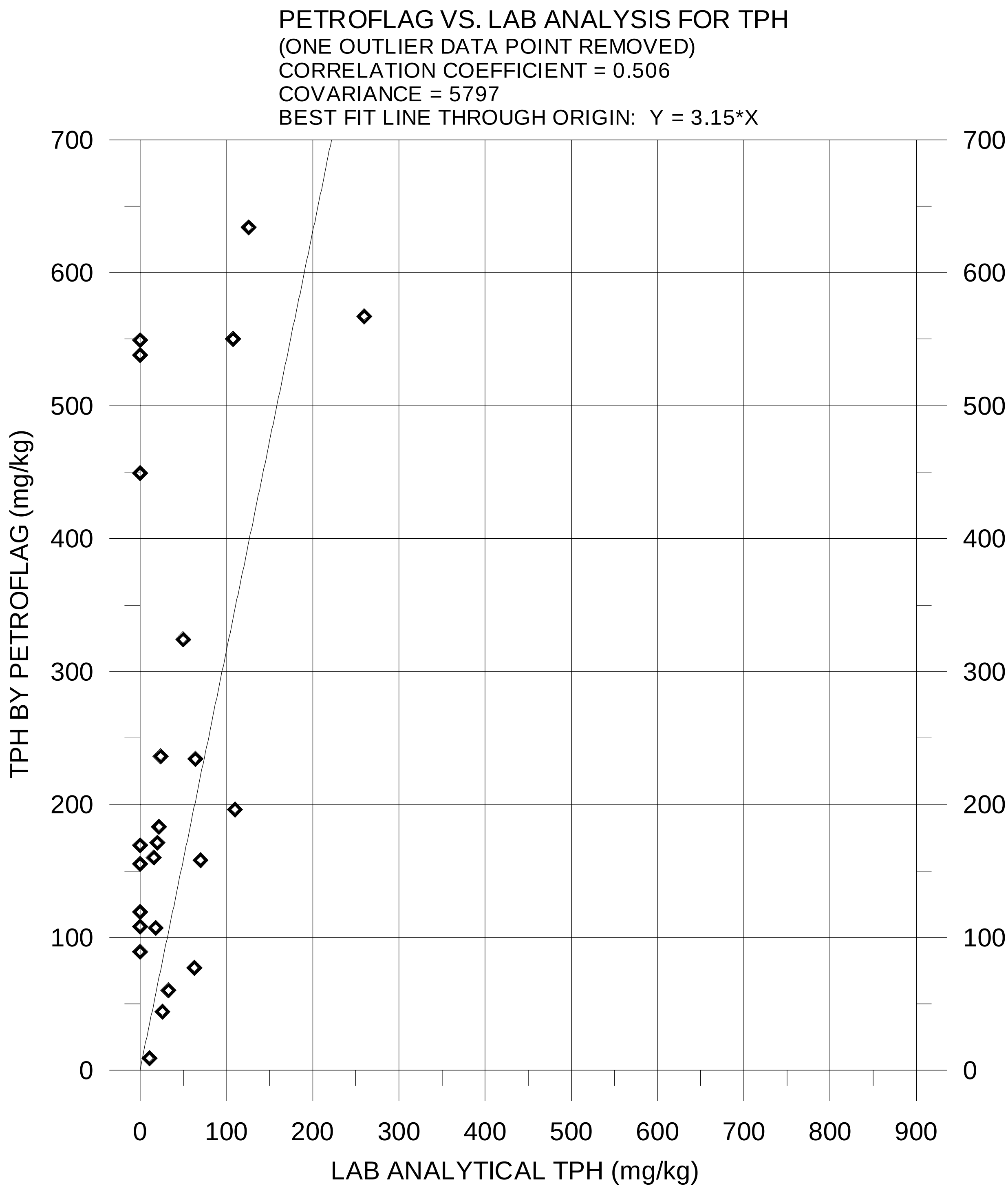
Boring	Sample Number	Lab ID#	Depth (feet)	TPH [1] (mg/kg)	Volatile Organics (mg/kg)	TPH by PetroFlag (mk/kg)
B-25	B25-3	KLF99071231-03A	10	27	ND	---
B-26	B26-10		10		---	366
	B26-23		23		---	411
	B26-28	KLF99081927-05A	28	ND	ND	538
	B26-38		38		---	362
B-27	B27-1B		25		---	5
	B27-2B	KLF99081927-03A	28	26	ND	44
	B27-3B		33		---	11
	B27-4B		41		---	4
B-28	B28-1A		13		---	61
	B28-2B	KLF99082533-02A	18	63	ND	77
	B28-3B		26		---	23
	B28-4B		31		---	40
B-29	B29-9		9		---	95
	B29-18		18		---	130
	B29-24	KLF9908253304A	24	16	ND	160
	B29-34		34		---	83
B-30	B30-2		2		---	82
	B30-15	KLF99082533-05A	15	50	ND	324
	B30-20		20		---	137
	B30-26		26		---	103
B-32	B32-1B		16		---	0
	B32-2A	KLF99082427-02A	26	110	ND	196
	B32-3B		32		---	84
P-1	P1-2A	KLF99081927-02A	5	820	ND	372
	P1-4C		13		---	98
	P1-5B		18		---	134
	P1-3A		10		---	52
	P1-10B		41		---	0
P-2	P2-10		10		---	96
	P2-11	KLF99090229-01A	25	18	ND	107
	P2-12		35		---	41
	P2-14		50		---	54

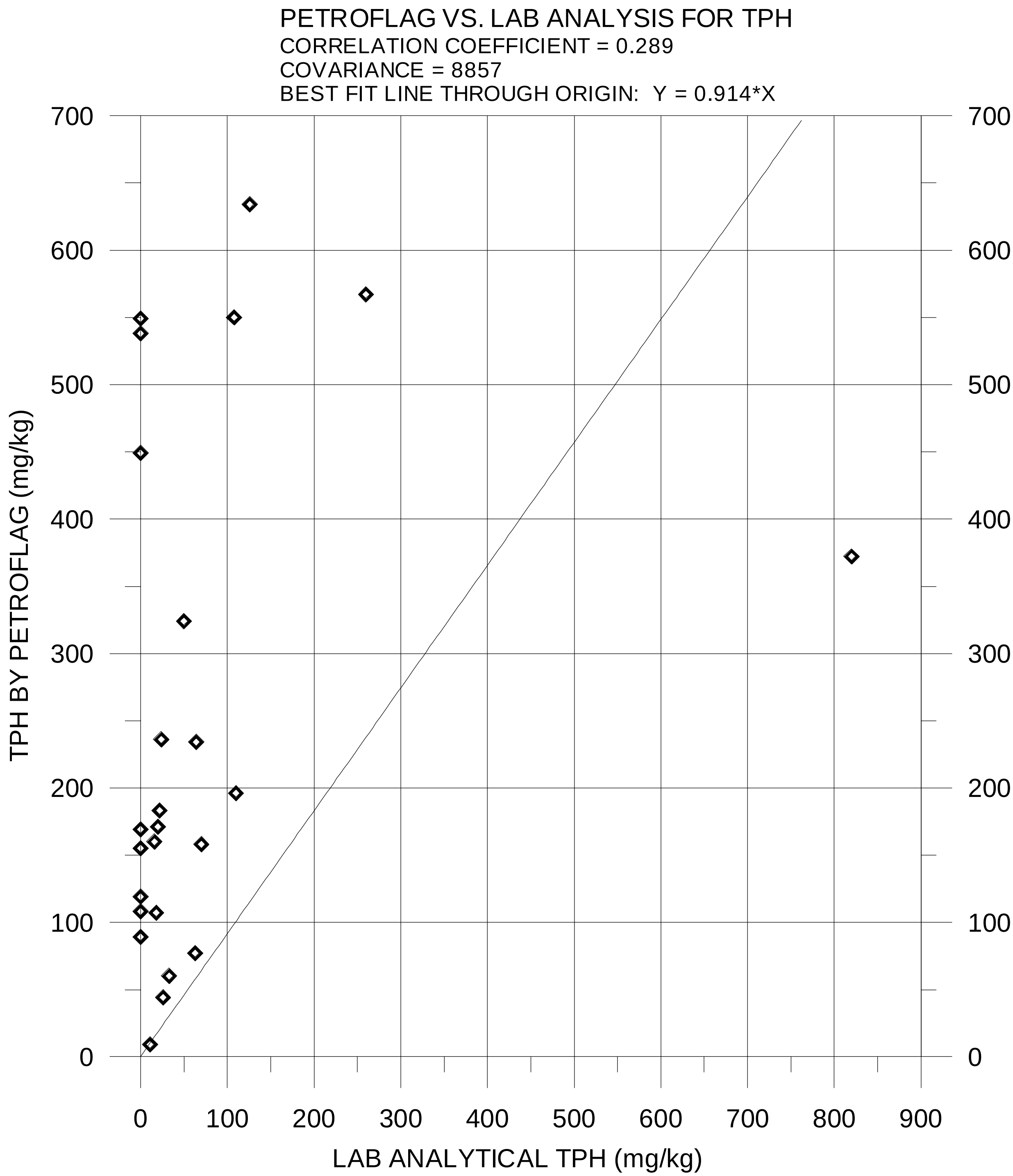
Boring	Sample Number	Lab ID#	Depth (feet)	TPH (1) (mg/kg)	Volatile Organics (mg/kg)	TPH by PetroFlag (mk/kg)
P-3	P3-9		9		---	146
	P3-23		23		---	49
	P3-28	KLF99082533-06A	28	ND	ND	155
	P3-40		40		---	50
LG-1	LG1-20	KLF99081927-01A	20	ND	ND	---
LG-2	LG2-22	KLF99081927-07A	22	ND	ND	---
LG-3	LG3-20	KLF99090128-01A	20		ND	---
	SF-2		5		---	31
	SF-3		7		---	23
	SF-4		7		---	21
	SF-5		5		---	41
	SF-6		7		---	359
	SF-7		5		---	74
	SF-8		5		---	37
	SF-9		5		---	54
	SF-10		5		---	2000
	SF-12		5		---	366

1. Data presented represents a total of all types of petroleum reported by a contract laboratory.
2. ND = Not detected at concentrations above method detection limit.

--- = Not analyzed

NR = No results due to matrix interference


PETROFLAG VS. LAB ANALYSIS FOR TPH
(ONE OUTLIER DATA POINT REMOVED)
CORRELATION COEFFICIENT = 0.506
COVARIANCE = 5797
BEST FIT LINE THROUGH ORIGIN: Y = 3.15*X
TPH BY PETROFLAG (mg/kg)
LAB ANALYTICAL TPH (mg/kg)
0
100
200
300
400
500
600
700
800
900


PETROFLAG VS. LAB ANALYSIS FOR TPH
CORRELATION COEFFICIENT = 0.289
COVARIANCE = 8857
BEST FIT LINE THROUGH ORIGIN: Y = 0.914*X
TPH BY PETROFLAG (mg/kg)
LAB ANALYTICAL TPH (mg/kg)
0
100
200
300
400
500
600
700
800
900

ATTACHMENT B

List of Options

The options listed below reflect that a variety of disposal methods and destinations are available for excess soils expected to be generated by the project. More than one option may well be selected, based on the type of soils, the presence of petroleum, the type of potential local uses available at the time the excess soils are generated, and the economics of each option.

The options Kleinfelder researched include:

Reuse Options

- City of Reno construction projects;
- Other public agency construction projects;
- Non-governmental construction projects (private sector);
- Daily cover at the Lockwood Landfill;
- Union Pacific Railroad; and
- Use on the subject project.

Disposal Options

- Disposal at the Lockwood Landfill; and
- Disposal at other permitted landfills.

Treatment Options – Offsite

- Treatment for excessive petroleum by Nevada Thermal Services;
- Treatment for excessive petroleum by the Lockwood Landfill;
- Treatment at other established permitted facilities;

Treatment Options-Onsite

- Bioremediation by the City of Reno; and
- Incineration by the City of Reno

Note that "on-site" assumes an area in the vicinity of, but not on the construction site.

A description of the assumptions, benefits, disadvantages and cost ranges follow for each option.

Discussion of Options

Reuse Options

The following reuse options include all material generated during this project as currently defined. Physical processes may be used to generate a desired grade of material for a wide range of applications. The applications may include such materials and uses as rip-rap, erosion control, landscaping, engineered fills, and general fills. Therefore, the following option discussions do not assume that the soil will be used for a single type of application.

1. Reuse on City of Reno Construction Projects

Kleinfelder spoke with representatives of the City of Reno Department of Public Works (DPW) and of the City of Reno Department of Parks and Recreation (DPR) about soil needs for construction projects. The DPW typically uses only select fill and generally has excess soils of which to dispose. The DPR may use several thousand cubic yards of soil of 1/2 inch minus. Normally, city engineers try to balance soil needs on and between projects. The need for soil on city projects is typically estimated for only 1 to as much as 2 years in advance. With appropriate soil type and knowledge of the soils availability, the DPR would consider acquiring such soil from the subject site based on immediate needs.

The advantages of city project use is that construction costs may be reduced, and that soils with low to moderate concentrations of petroleum (non-detect to 100 mg/kg) may be permitted for use. The disadvantages are that the need for soil on city projects appears to be minimal, that the soil may not meet the specifications, and that the projects and soil volumes needed when the soils will be available are not yet predictable with any confidence.

2. Reuse on Other Public Agency Projects

Such public entities as the Washoe County Department of Public Works, the University of Nevada at Reno, Nevada Department of Transportation (NDOT) and the State of Nevada Department of Public Works administer significant public construction projects each year. These agencies may consider the economics of the availability of these soils for projects in the Reno/southern Washoe County area.

The advantages of this option are that the soils would be reused rather than disposed of as waste, and the project costs would be reduced. The disadvantages are that the soils would not be used in a predictable and rapid manner, the soils may have to be substantially sorted to meet different project specifications, a storage area would be required for an indefinite time, and soils with petroleums could entail arrangements as to specific use, permitting, and liability.

3. Reuse on Non-governmental Construction Projects (private sector)

The private sector typically uses many hundreds of thousands of cubic yards of soil of various types per year in the Reno area, involving numerous contracting companies, both large and small. These companies usually work with well scoped and budgeted projects with a one year horizon or less. Development companies who plan the projects usually have a longer planning horizon. The private sector typically carefully evaluates and takes advantage of the lowest cost construction materials.

Soils from this project would have to be readily available, be of suitable gradation, and be economically advantageous coincident with one large project or many smaller projects. A schedule of the soils availability and quality should allow developers and contractors to better conduct advance project planning and reduce the unpredictable nature of the demand for the soil. The soils could be let to one party, to a few, or to many. A contract with one party or a few would have the advantages of reduced administration, utilizing an economy of scale based on large soil volumes, and provide that party(ies) the option(s) of using or of selling the soil as a product.

The advantage of this option is that at least some of the soils would be reused rather than disposed as a waste, the reused soils would be a local economic benefit, and the city would not have to provide storage (e.g. the contractor would be required to remove them from the project area). The disadvantages are that soils with excessive petroleum could entail arrangements as to specific use, permitting, and liability, which may render the process of awarding a bid difficult. For this option, excessive petroleum may mean any concentration above the detection limit due to liability concerns.

4. Use by Reno Disposal as Daily Cover at the Lockwood Landfill

The finer portion of the soil (less than 6 inch diameter cobble/gravel) is reusable, once screened, as daily cover at Reno Disposal's Lockwood Landfill. The landfill covers each day's refuse with 18 inches of compacted soil. The landfill maintains a stockpile of soil for this purpose and routinely evaluates waste soils of sufficient volume and quality for use as cover. The landfill reserves the final decision as to reuse or disposal. In most situations, the action level for use of soil with petroleum is 100 mg/kg. However, the landfill is permitted to use soil for the daily cover application that has a petroleum concentration as high as 600 mg/kg.

The landfill currently charges $2.50 per cubic yard for receipt of soil as a standard waste. The transportation and driver labor cost per truck from Reno is currently estimated at $150 per load (based on 20 cubic yards per truck load), or $7.50 per yard, or about $6 per ton (based on 1.25 tons per cubic yard). Based on our recent discussion with representatives of Reno Disposal, the landfill has the capacity for the soil to be generated during this project.

The advantage of this option is that the soil is used, not disposed, the soil resource on which the landfill relies would be extended, and the soil can relatively quickly be removed from the construction site. The disadvantages are the landfill fees, the transportation, and the costs of physically and analytically screening the soils prior to transport. Soil received by the landfill that is not suitable for daily cover is disposed as a waste. Data obtained during Kleinfelder's subsurface assessment of the Reno Rail Corridor indicated that only one sample out of thirty analyzed contained a concentration of petroleum in excess of the permitted maximum concentration of 600 mg/kg. Based on this single data point, we estimate there may be as much as 3% to 5 % of the total volume of soil generated during this project that may not be chemically suited for the daily cover option due to excessive hydrocarbons.

5. Use by Union Pacific Railroad

Union Pacific may have rail-related projects that could require the use of the excess soils. Kleinfelder has not discussed this option with Union Pacific.

The advantages of this option are that Union Pacific has the ability to transport the soils by rail, a greater distance is economically available to suitable sites, and the soils can be removed quickly from the construction zone. The disadvantages include location of suitable sites within the construction project's time frame, soils with high concentrations of petroleums likely could not be so used, possible permitting issues for soils with low concentrations of petroleums for out-of-county and out-of-state locations, modifying the available soils sufficiently for meeting reuse specifications, and the staging of rail cars in the construction area.

6. Use on the Railroad Corridor Project

The below grade track scenario includes the construction of street crossings at eleven locations. Other structures could be considered based on the final design selected. These structures would require soils to build the approach ramps. This soil likely could be obtained from the excess soils from the lowering of the tracks.

This option would reduce the cost of importing soils, reduce the cost of exporting the excess soils, and probably could utilize soils with moderate concentrations of petroleums at minimal liability. The disadvantages are only that the excess soils will likely require screening, and that not all the excess soils would be needed for this purpose.

Disposal Options

7. Disposal at the Lockwood Landfill

The soil with sufficiently low petroleum concentration (currently less than 600 mg/kg) could be disposed as a standard waste at the Lockwood Landfill. This would occur in the event the soil is not suitable as daily cover or if the landfill cannot receive and store the soil due to a surplus of daily cover material. The landfill reserves the final decision as to reuse or disposal.

The landfill currently charges $2.50 per cubic yard for receipt of soil as a standard waste. The transportation and driver labor cost per truck from Reno is currently estimated at $150 per load (based on 20 cubic yards per truck load), or $7.50 per yard, or about $6 per ton (based on 1.25 tons per cubic yard).

The advantages of this option include quick removal of the excess soil from the construction site, easy permitting processes and relatively predictable fees. The disadvantages include the landfill fees, the transportation costs and the volume of material that is disposed rather than reused/recycled.

8. Disposal at Other Permitted Landfills

Other landfill facilities exist outside the Reno area permitted to receive the soils for disposal purposes and have the size to accommodate the anticipated soil volumes. The closest such facilities include those in southern Nevada, northern Nevada, California, Utah and Idaho. This memorandum does not provide specifics of such facilities.

The advantages include relatively quick removal of the soils from the project site. The disadvantages include high costs of transportation, permitting, locating prospective sites that are willing to take the soil volumes, and the release of liability associated with soils with petroleum concentrations.

Treatment Options

9. Treatment for Excessive Petroleum by Nevada Thermal Services

Nevada Thermal Services (NTS) in Storey County, Nevada is permitted by the Nevada Department of Environmental Protection to treat non-hazardous petroleum contaminated soils by incineration. The treatment reduces the petroleum concentration to non-detect (below 10 mg/kg). The resulting treated soils are then sold for reuse. NTS provides a certificate of treatment, thereby greatly reducing the liability to the generator.

NTS currently provides treatment on a sliding cost scale, with cost dropping as tonnage increases, to a lowest listed unit cost of $30 per ton.

The advantages of this option is that the soils can be removed quickly from the construction area, they receive relatively quick and thorough treatment, the liability to the generator is very low, the soils are reused after treatment, and the costs are relatively low for soils with petroleum concentrations above 600 mg/kg. The disadvantage of this method is that the cost is relatively high for soils with petroleum concentrations below 600 mg/kg when compared to other options.

10. Treatment for Excessive Petroleum by the Lockwood Landfill

Lockwood Landfill can treat soils with petroleum concentrations in excess of 600 mg/kg by on-site bio-remediation. The facility operates under permit by the State of Nevada a bio-remediation cell at the landfill. By adding moisture, nutrients and air, the hydrocarbon concentrations reduce through biological reduction. Once the soils have been treated to below 600 mg/kg of petroleum, they are disposed into the landfill as a standard waste or used as daily cover. The treatment process may take from weeks to more than one year.

Lockwood currently provides treatment on a sliding cost scale, with cost increasing as hydrocarbon concentration increases. The current costs range from $28.20 per cy at 601 to 1000 mg/kg to $31.35 per cy at 1001 to 2500 mg/kg to $41.80 per cy for greater than 2500 mg/kg.

The advantages of this option are that the soil can be quickly removed from the project site, easy permitting processes and relatively predictable fees. The disadvantages include the landfill fees, the transportation costs, the relatively long time to the end of treatment, and the incompleteness of treatment.

It should be noted that Lockwood Landfill offers to also provide incineration services. It currently does not have a permanent incineration facility, but will set one up if requested and if the soil volume is sufficient.

11. Treatment at Other Permitted Facilities

Other facilities are permitted for the treatment of soils with excessive petroleum, however, these are all located out of the Reno area. These include California sites in the vicinity of Stockton and Redding, an asphalt batch plant in Las Vegas, and sites in Idaho and Utah. The advantage of these sites are that they are permitted facilities. The disadvantages are the facility entry fees and requirements, agency permitting processes and the transportation costs.

12. Bioremediation by the City of Reno

If the excessively contaminated soils are sufficient in volume, the City of Reno could set up a treatment location under permit from the Washoe County District Health Department. The type of treatment method used would be dependent on the concentration and type of petroleum actually present in the soil. Based on the available information, the contaminants are expected to lie in the range of diesel and oil. We anticipate that the soils could be treated with a combination of aeration and bioremediation. This process would reduce the petroleum either to below the 600 mg/kg level so they could be disposed at the Lockwood Landfill, or to between 100 and 600 mg/kg so they could be reused at an approved City of Reno project site. Typically such a method is cost-effective with soil volumes greater than 3,000 cubic yards due to the initial design, permitting and construction costs, and depending on the cost of alternative treatment methods in the vicinity.

The advantages of this option are a reduction in comparable treatment and transportation costs, depending on volume, and reuse of the soils after treatment. The disadvantages are that a treatment site will be needed, a design workplan must be prepared, permitting must be obtained, and the treatment is likely to take from several months to as much as several years.

13. Local Incineration

If the excessively contaminated soils are sufficient in volume and petroleum concentration, the City of Reno could set up a local treatment facility under permit from the Washoe County District Health Department. The kind of treatment would also be dependent on the contaminants actually present. Based on the available information, the contaminants are expected to lie in the range of diesel and oil. Based on this data, the soils could be treated with a temporary mobile incinerator. This process would reduce the petroleum concentrations below the 100 mg/kg level so they could be reused with little or no restrictions, ideally at an City of Reno project site or on the subject project. Typically such a unit is cost-effective with soil volumes greater than 5,000 cubic yards due to the start-up costs, and depending on the cost of alternative treatment methods in the vicinity.

The advantages of this option are a reduction in comparable treatment and transportation costs depending on volume, reuse of the soils after treatment, completeness of treatment and short treatment time. The disadvantages are that an acceptable and close location must be selected for the incineration unit and that permitting must be obtained.